

CLAIMS

I claim:

1. A method for aseptically filling a package having an inside, a filling aperture, and a
5 membrane fitted over the filling aperture, the method comprising the steps of:
 filling the inside of the package with a sterilizing vapour;
 holding the sterilizing vapour on the inside of the package for a sufficient amount of time
to sterilize the inside of the package;
 removing a portion of the sterilizing vapour;
10 filling the package with a product;
 capping the filling aperture of the package containing the product;
wherein the membrane is in place over the filling aperture during all steps of the method.
2. The method of claim 1, further comprising the step of allowing a sufficient quantity of
the sterilizing vapour to exit the package before filling the package with a product to avoid
15 affecting the quality of the product, wherein the sterilizing vapour exits the package and
sterilizes a part of a filling device that comes into contact with the product.
3. The method of claim 1, wherein the membrane material is an elastomer selected from the
group consisting of silicone rubber, natural rubber, butadiene, nitrile, sulphonic, isoprene,
polyurethane, and viton.
- 20 4. The method of claim 1, wherein the membrane opens to greater than about 10% of the
area of the filling aperture during the filling steps.
5. The method of claim 2, further comprising the step of displacing the sterilizing vapour
with sterile air, wherein the sterile air forms a headspace of the capped package.
6. The method of claim 2, further comprising the step of displacing the sterilizing vapour
25 with inert, sterile gas, wherein the inert sterile gas forms a headspace of the capped package.
7. The method of claim 2, further comprising the step of pressing the membrane segments
tightly against inner walls of the package to accelerate displacement of the sterilizing vapour by
eliminating the gap between membrane segments and the inside of the package.

8. The method of claim 1, further comprising the step of allowing the sterilizing vapour to exit from the package during the step of filling the package with sterilizing vapour, wherein the sterilizing vapour that exits the package sterilizes an external surface of the package.
9. The method of claim 1, further comprising the step of conveying the package between the
5 filling steps and the capping step in a non-sterile atmosphere, wherein the inside of the package remains substantially free of microbiological contamination.
10. The method of claim 1, further comprising the step of wetting the membrane with a fluid, wherein the wetted membrane has an increased ability to prevent entry of contaminants.
11. The method of claim 10, wherein the fluid contains a bactericide and a thickener to
10 increase the viscosity of the fluid.
12. The method of claim 1, further comprising the step of heating the package, wherein the heating increases the internal pressure of the gas in the package, and enhances prevention of entry of contaminants into the package.
13. The method of claim 1, wherein the method is performed using conventional non-aseptic
15 filling equipment adapted to fill aseptically.
14. The method of claim 13, wherein the non-aseptic filling equipment is used aseptically part time.
15. The method of claim 1, further comprising the step of sterilizing an outside surface of the membrane before the capping step.
- 20 16. The method of claim 15, wherein the step of sterilizing an outside surface of the membrane is achieved with a sterilizing medium that has a sterilizing effect of limited duration.
17. The method of claim 15, wherein the step of sterilizing an outside surface of the membrane is achieved with a sterilizing medium that does not affect the quality of the product in small amounts.
- 25 18. The method of claim 1, further comprising the step of rinsing the parts of the filling device that come in contact with the product to be filled with hot water after each filling step.
19. The method of claim 18, further comprising the step of sterilizing the parts of the filing device that come in contact with the product to be filled between filling operations by spraying

with chlorinated water, by ultraviolet light, by enclosing in sterilizing vapour, or any combination thereof.

20. A system for aseptically filling a package having a filling aperture, the system comprising:

- 5 a membrane over the filling aperture of the package;
- a means for filling the inside of the package with sterilizing vapour;
- a means for holding the sterilizing vapour inside the package for a time sufficient to sterilize internal contact parts of the package and membrane;
- a filling device for filling the package with a product without removing the membrane;
- 10 a means for removing a sufficient quantity of the sterilizing vapour from the package before filling the package with a product to avoid affecting the quality of the product, wherein the sterilizing vapour exits the package and sterilizes a part of a filling device that comes into contact with the product;
- a means for capping the package without removing the membrane.

15 21. The system of claim 20, wherein the membrane is an elastomer selected from the group consisting of silicone rubber, natural rubber, butadiene, nitrile, sulphonic, isoprene, polyurethane, and viton.

22. The system of claim 20, wherein a sprung insert replaces a conventional sealing material on the filling device and holds the membrane in place over the filling aperture during insertion of
20 filling machine parts.

23. The system of claim 20, wherein the membrane opens to greater than 10% of the area of the aperture.

24. The system of claim 22, wherein the sprung insert provides a vapour seal in conjunction with the membrane.

25 25. The system of claim 22, further comprising conveyors to and from the filling device and the means for filling, wherein the conveyors are partly or wholly fitted with covers that contain sterilizing vapour to sterilize the outer surfaces of the package.

26. The system of claim 22, wherein the sterilizing vapour is expelled through a snift valve of the filling device.

27. A package comprising a filling aperture and an aperture-closing device, wherein the aperture-closing device opens to provide an opening that is greater than about 10% of the area of the aperture, and closes to provide a substantial barrier against contamination from outside the package and said device reseals after being mechanically opened.
- 5 28. The package of claim 27, wherein the sealing provided by the device is sufficient to substantially trap a vapour content of the package.
29. The package of claim 27, wherein the aperture-closing device is a flexible membrane.
30. The package of claim 29, wherein the membrane is an elastomer selected from the group consisting of silicone rubber, natural rubber, butadiene, nitrile, sulphonic, isoprene,
10 polyurethane, and viton.
31. The package of claim 30, wherein the flexible membrane comprises flexible segments.
32. The package of claim 30, wherein the flexible membrane achieves its opening and re-closing function through its elasticity, shape, or a combination thereof.
33. The package of claim 27, wherein the aperture-closing device comprises a self-re-closing,
15 hinged flap.
34. The package of claim 33, wherein the hinged flap substantially seals against an outer rim of the aperture-closing device.
35. The package of claim 33, wherein the hinged flap substantially seals against an inner bore of the package aperture.
- 20 36. A package comprising a filling aperture and a flexible membrane fitted over the filling aperture, the flexible membrane comprising flexible segments, wherein said flexible segments are adapted to permit passage of a sterilizing tube and a filling valve and to re-close with a sufficient seal to substantially trap a vapour content of the package when the sterilizing tube and filling valve are withdrawn.
- 25 37. The package of claim 36, wherein the vapour trapped is a sterilizing vapour.
38. The package of claim 36, wherein the flexible membrane is adapted to attach to a cap for the package.

39. The package of claim 36, wherein the membrane opens to greater than 10% of the area of the filling aperture to accommodate the sterilizing tube and the filling valve.
40. The package of claim 36, wherein the membrane is an elastomer selected from the group consisting of silicone rubber, natural rubber, butadiene, nitrile, sulphonic, isoprene,
5 polyurethane, and viton.
41. The package of claim 38, wherein the membrane replaces a sealing compound on the cap and the membrane is adapted to adhere to the cap.
42. The package of claim 36, wherein the flexible segments have edges that are adapted to fit together or to overlap.
- 10 43. The package of claim 27 or 36, wherein the package is a plastic bottle.
44. The package of claim 27 or 36, wherein the package is a PET bottle.
45. The package of claim 27 or 36, wherein the package is a metal or plastic can.
46. The package of claim 27 or 36, wherein the package is a glass bottle.
48. The package of claim 27 or 36, wherein the membrane is constructed of multiple
15 materials.
49. The package of claim 27 or 36, wherein the package is a flexible material and the filling aperture is a rigid material. .
50. The package of claim 27 or claim 36, wherein the package is constructed of multiple materials, layered materials or coated materials.
- 20 51. The package of claim 27 or 36, wherein the flexible segments are adapted to permit the membrane to open to greater than about 10% of the area of the filling aperture.
52. The package of claim 51, wherein the flexible segments are adapted to permit the membrane to open to greater than about 50% of the area of the filling aperture.
53. The package of claim 52, wherein the flexible segments are adapted to permit the
25 membrane to open to greater than about 90% of the area of the filling aperture.